4.7 Air Resources

This section describes the air resources of the Kentucky Pioneer IGCC Demonstration Project and the surrounding area.

4.7.1 Climate and Meteorology

The Kentucky Pioneer IGCC Demonstration Project site is characterized by warm summers and moderately cold winters. Average daily low temperatures range from about negative 5.5 degrees Celsius (°C) (22 degrees Fahrenheit [°F]) in January to about 19°C (66°F) in July (EIV 2000). Average daily high temperatures range from about 9°C (39°F) in January to about 30°C (86°F) in July. The average length of the growing season is about 181 days. On average, periods with freezing temperatures occur between October 26 and April 23.

The normal annual precipitation is approximately 114 centimeters (45 inches), with a small portion occurring as snowfall. Precipitation is distributed fairly uniformly throughout the year. Fall and winter precipitation is usually associated with the passage of warm or cold fronts. Summer precipitation often occurs as brief heavy showers or thunderstorms.

Regional prevailing winds are from the south and south-southwest during most of the year. The only relatively recent meteorological data collected on the EKPC property was obtained during a 6-month period in 1979. The monitoring instrument was located about 1.6 kilometers (1 mile) southwest of the proposed Kentucky Pioneer IGCC Demonstration Project site. The on-site meteorological data indicated that winds at that location were most often from either the south-southwest or northeast during the measurement period (UEC 1980). The meteorological tower was in a valley aligned with the measured predominant wind directions, indicating that local terrain conditions affected the site. Wind directions at the project site may be slightly different.

4.7.2 Ambient Air Quality

4.7.2.1 Terminology

This section presents definitions of technical terminology associated with air pollution. It is important to understand the distinction between air pollutant emissions and ambient air quality. Other important terms include primary pollutants, secondary pollutants, and pollutant precursors.

The term "pollutant emissions" refers to the amount (usually stated as a weight) of one or more specific compounds introduced into the atmosphere by a source or group of sources. In practice, most pollutant emissions data are presented as "emission rates": the amount of pollutants emitted during a specified increment of time or during a specified increment of emission source activity. Typical measurement units for emission rates on a time basis include pounds per hour, pounds per day, or tons per year (TPY). Typical measurement units for emission rates on a source activity basis include pounds per thousand gallons of fuel burned, pounds per ton of material processed, and grams per vehicle mile of travel.

The term "ambient air quality" refers to the atmospheric concentration of a specific compound (amount of pollutants in a specified volume of air) actually experienced at a particular geographic location that may be some distance from the source of the relevant pollutant emissions. Ambient air quality data generally are reported as a mass per unit volume (e.g., micrograms per cubic meter of air) or as a volume fraction (e.g., parts per million by volume).

The ambient air quality levels actually measured at a particular location are determined by the interactions among three groups of factors: emissions, meteorology, and chemistry. Emission considerations include the types, amounts, and locations of pollutants emitted into the atmosphere. Meteorological considerations include wind and precipitation patterns affecting the distribution, dilution, and removal of pollutant emissions. Chemical considerations are important when chemical reactions transform pollutant emissions into other chemical substances.

Air pollutants are often characterized as being "primary" or "secondary" pollutants. Primary pollutants are those emitted directly into the atmosphere, such as carbon monoxide, sulfur dioxide, lead, particulates, and hydrogen sulfide. Secondary pollutants are those formed through chemical reactions in the atmosphere, such as ozone, nitrogen dioxide, and sulfate particles. Atmospheric chemical reactions usually involve primary pollutants, normal constituents of the atmosphere, and other secondary pollutants. Meteorological conditions such as temperature, humidity, and the intensity of ultraviolet light can also play an important role in atmospheric chemistry.

Those compounds which react to form secondary pollutants are often referred to as reactive pollutants, pollutant precursors, or precursor emission products. Some air pollutants, such as many organic gases and suspended particulate matter, are a combination of primary and secondary pollutants.

Ozone, a major component of photochemical smog, is the secondary pollutant of greatest concern in most parts of the country. The pollutant emissions generally categorized as ozone precursors fall into two broad groups of chemicals: nitrogen oxides and organic compounds. Many different terms are used to refer to these groups of ozone precursors.

The terms "nitrogen oxides" and "oxides of nitrogen" are often used interchangeably to refer to the combination of nitric oxide and nitrogen dioxide. This combination of nitrogen oxides is often designated by the symbol NO_X. Nitrogen dioxide is itself a secondary pollutant, generally formed from nitric oxide.

Organic compound precursors of ozone are routinely described by a large number of different terms. The phrase "reactive organic compounds" is the most accurate terminology for describing organic compound precursors of ozone, but the acronym for that phrase is not widely used. The closest widely used acronym is reactive organic gases (ROG). To avoid inventing a new acronym, ROG will be used in this document to mean reactive organic compounds.

Inhalable particulate matter (PM_{10}) can be generated as a primary pollutant by abrasion or erosion processes. PM_{10} can also form as a secondary pollutant through chemical reactions or by condensation of gaseous pollutants into fine aerosols. Major gaseous precursors of PM_{10} include reactive organic gases, sulfur oxides (SO_X), and NO_X. Additional precursors of PM_{10} can include ammonia, hydrogen sulfide (H_2S), sulfuric acid, and nitric acid.

4.7.2.2 Air Quality Management

Air quality management programs have evolved using two management approaches. One approach is setting ambient air quality standards for acceptable exposure to air pollutants, conducting monitoring programs to identify locations experiencing air quality problems, and then developing programs and regulations designed to reduce or eliminate those problems. The second approach is identifying specific chemical substances that are potentially hazardous to human health, and then regulating the amount of those substances that can be released by individual commercial or industrial facilities or by specific types of equipment.

Air quality programs based on ambient air quality standards typically address air pollutants that are produced in large quantities by widespread types of emission sources and which are of public health concern because of their toxic properties. Air quality programs based on regulation of other hazardous substances typically address chemicals used or produced by limited categories of industrial facilities. Programs regulating hazardous air pollutants focus on substances that alter or damage the genes and chromosomes in cells, creating the potential for cancer, birth defects, or other developmental abnormalities; substances with serious acute toxicity effects; and substances that undergo radioactive decay processes, resulting in the release of ionizing radiation.

4.7.2.3 Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) has established ambient air quality standards for several different pollutants, which are often referred to as criteria pollutants (see Table 4.7-1). Ambient standards for some of these pollutants have been set for both short and long time periods. Federal ambient air quality standards are based primarily on evidence of acute and chronic health effects. The State of Kentucky has adopted federal ambient air quality standards for criteria pollutants. In addition, the state has adopted standards for H_2S, gaseous fluorides, and odors. The state has also established a standard for total fluorides in and on forage consumed by grazing animals. These additional state air quality standards are summarized in Table 4.7-2.

Air pollutants can be categorized by the nature of their toxic effects including: (1) irritants (such as ozone, PM_{10}, NO_x, SO_x, sulfate particles, H_2S, and vinyl chloride) that affect the respiratory system, eyes, mucous membranes, or the skin; (2) asphyxiants (such as carbon monoxide [CO] and nitric oxide) that displace oxygen or interfere with oxygen transfer in the circulatory system, affecting the cardiovascular and central nervous systems; (3) necrotic agents (such as ozone, NO_x, and SO_x) that directly cause cell death; or (4) systemic poisons (such as lead particles) that affect a range of tissues, organs, and metabolic processes.

Ozone and particulate matter are the most common air pollution problems in most parts of the country, with CO being an additional pollutant of concern in urbanized areas. Ozone is a strong oxidizing agent that reacts with a wide range of materials and biological tissues. Ozone is also a respiratory irritant that can cause acute and chronic effects on the respiratory system. Recognized effects include reduced pulmonary function, pulmonary inflammation, increased airway reactivity, aggravation of existing respiratory diseases (such as asthma, bronchitis, and emphysema), physical damage to lung tissue, decreased exercise performance, and increased susceptibility to respiratory infections (Horvath and McKee 1994). In addition, ozone causes significant damage to leaf tissues of crops and natural vegetation. Ozone also damages many materials by acting as a chemical oxidizing agent. Because of its chemical activity, indoor ozone levels are usually much lower than outdoor levels.

Suspended particulate matter represents a diverse mixture of solid and liquid material having size, shape, and density characteristics that allow the material to remain suspended in the air for meaningful time periods. The physical and chemical composition of suspended particulate matter is highly variable, resulting in a wide range of public health concerns.

Many components of suspended particulate matter are respiratory irritants. Some components (such as crystalline or fibrous minerals) are primarily physical irritants. Other components are chemical irritants (such as sulfates, nitrates, and various organic chemicals). Suspended particulate matter also can contain compounds (such as heavy metals and various organic compounds) that are systemic toxins or necrotic agents. Suspended particulate matter or compounds adsorbed on the surface of particles can also be carcinogenic or mutagenic chemicals.

Table 4.7-1. National Ambient Air Quality Standards

Pollutant	Symbol	Averaging Time	National Ambient Air Quality Standards: Parts Per Million	Micrograms Per Cubic Meter	Violation Criteria
Ozone	0_3	1 hour	0.12	235	If exceeded on more than 3 days in a 3-year period
		8 hours	0.08	157	If exceeded by the mean of annual 4th highest daily values for a 3-year period
Carbon Monoxide	CO	8-hours	9	10,000	If exceeded on more than 1 day per year
		1-hour	35	40,000	If exceeded on more than 1 day per year
Inhalable Particulate Matter	PM_{10}	Annual Arithmetic Mean	—	50	If exceeded as a 3-year single station average
		24 hours	—	150	If exceeded by the mean of annual 99th percentile values over 3 years
Fine Particulate Matter	$PM_{2.5}$	Annual Arithmetic Mean	—	15.0	If exceeded as a 3-year spatial average of data from designated stations
		24 hours	—	65	If exceeded by the mean of annual 98th percentile values over 3 years
Nitrogen Dioxide	NO_2	Annual Average	0.053	100	If exceeded
Sulfur Dioxide	SO_2	Annual Average	0.03	80	If exceeded
		24 hours	0.14	365	If exceeded on more than 1 day per year
		3 hours	0.5	1,300	If exceeded on more than 1 day per year
Lead Particles (TSP Sampler)	Pb	Calendar Quarter	—	1.5	If exceeded

Notes: All standards except the national PM_{10} and $PM_{2.5}$ standards are based on measurements corrected to 25 degrees C and 1 atmosphere pressure. The national PM_{10} and $PM_{2.5}$ standards are based on direct flow volume data without correction to standard temperature and pressure.
Decimal places shown for standards reflect the rounding precision used for evaluation compliance. Except for the 3-hour sulfur dioxide standard, the national standards shown are the primary (health effects) standards. The national 3-hour sulfur dioxide standard is secondary (welfare effects) standard. EPA adopted new ozone and particulate matter standards on July 18, 1997. The new standards have been challenged in court, and final appeals have not been decided. Thus, implementation of the new standards is on hold and remain under court review. Previous national PM_{10} standards (which had different violation criteria than the September 1997 standards) will remain in effect for existing PM_{10} nonattainment areas until EPA takes actions required by Section 172(e) of the *Clean Air Act* or approves emission control programs for the relevant PM_{10} state implementation plan. Violation criteria for all standards except the national annual standard for $PM_{2.5}$ are applied to data from individual monitoring sites. Violation criteria for the national annual standard for $PM_{2.5}$ are applied to a spatial average of data from one or more community-oriented monitoring sites representative of exposures at neighborhood or larger spatial scales (40 CFR Part 58). The "10" in PM_{10} and the "2.5" in $PM_{2.5}$ are not particle size limits; these numbers identify the particle size class (aerodynamic equivalent diameters in microns) collected with 50% mass efficiency by certified sampling equipment. The maximum particle size collected by PM_{10} samplers is about 50 microns aerodynamic equivalent diameter; the maximum particle size collected by $PM_{2.5}$ samplers is about 6 microns aerodynamic equivalent diameter.
TSP = total suspended particulates.
Sources: 40 CFR Parts 50, 53, and 58.

Table 4.7-2. Additional State of Kentucky Air Quality Standards

National Ambient Air Quality Standards				
Pollutant	**Averaging Time**	**Parts Per Million**	**Micrograms Per Cubic Meter**	**Violation Criteria**
Hydrogen Sulfide	1 hour (secondary)	0.01	14	If exceeded more than once per year
Gaseous Fluorides (as HF)	24 Hours (primary)	1.0	800	If exceeded more than once per year
	Annual Average (primary)	0.5	400	If exceeded
	12 Hours (secondary)	0.0045	3.68	If exceeded more than once per year
	24 Hours (secondary)	0.0035	2.86	If exceeded more than once per year
	1 Week (secondary)	0.0020	1.64	If exceeded more than once per year
	1 Month (secondary)	0.0010	0.82	If exceeded more than once per year
Total fluorides (F ion, dry weight basis in or on forage)	1 Month (secondary)	80		If exceeded
	2 Months (secondary)	60		If exceeded
	Growing Season Average (secondary)	40		If exceeded in samples over a period of up to 6 months
Odors	(secondary standard)			If detectable after 7:1 dilution of ambient air by odorless air

Note: Primary standards are based on public heath considerations: Secondary standards are based on protection of general welfare and property.
Source: Kentucky Administrative Regulations, Title 401, Chapter 53, Section 010.

Public health concerns focus on the particle size ranges likely to reach the lower respiratory tract or the lungs. Inhalable particulate matter represents particle size categories that are likely to reach either the lower respiratory tract or the lungs after being inhaled. Fine particulate matter ($PM_{2.5}$) represents particle size categories likely to penetrate to the lungs after being inhaled.

In addition to public health impacts, suspended particulate matter causes a variety of material damage and nuisance effects: abrasion; corrosion, pitting, and other chemical reactions on material surfaces; soiling; and transportation hazards due to visibility impairment.

Carbon monoxide is a public health concern because it combines readily with hemoglobin in the blood, and thus reduces the amount of oxygen transported to body tissues. Relatively low concentrations of CO can significantly affect the amount of oxygen in the bloodstream since CO binds to hemoglobin 200-250 times more strongly than oxygen. Both the cardiovascular system and the central nervous system can be affected when 2.5 to 4.0 percent of the hemoglobin in the blood is bound to CO rather than to oxygen (Goldsmith 1986; Gutierez 1982; McGrath 1982). Because of its low chemical reactivity and low solubility, indoor CO levels usually are similar to outdoor levels.

In July 1997, EPA revised the violation criteria for the existing PM_{10} standards, adopted a new 8-hour ozone standard, and adopted new $PM_{2.5}$ standards. In 1998, EPA rescinded the federal 1-hour ozone standard for areas that had achieved the standard. Due to ongoing litigation over the new 8-hour ozone standard, the 1-hour ozone standard was reinstated for all areas in July 2000. The previous PM_{10} standards will be rescinded (with the revised PM_{10} standards remaining in place) after emission control programs required by the previous standards are approved by EPA. The new particulate matter and ozone standards have been challenged in court. Air quality management programs related to these standards are on hold pending final resolution of the court challenges.

4.7.2.4 Air Quality Planning

The federal *Clean Air Act* (CAA) requires each state to identify areas which have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce federal ambient air quality standards in these nonattainment areas. Deadlines for achieving the federal air quality standards vary according to air pollutant and the severity of existing air quality problems. The SIP must be submitted to and approved by EPA. SIP elements are developed on a pollutant-by-pollutant basis whenever one or more air quality standards are being violated.

The status of areas with respect to federal ambient air quality standards is categorized as nonattainment, attainment (better than national standards), unclassifiable, or attainment/cannot be classified. For most air pollutants, initial federal status designations are made using only two categories (either nonattainment and unclassifiable, or nonattainment and attainment/cannot be classified). For simplicity and clarity, the federal unclassifiable and attainment/cannot be classified designations will be called unclassified throughout this EIS. The unclassified designation includes attainment areas that comply with federal standards as well as areas for which monitoring data are lacking. Unclassified areas are treated as attainment areas for most regulatory purposes.

A formal attainment designation generally is used only for areas that transition from a nonattainment status to an attainment status. Areas that have been reclassified from nonattainment to attainment of federal air quality standards are automatically considered "maintenance areas," although this designation is seldom noted in status listings. Federal nonattainment designations for ozone, CO, and PM_{10} normally include subcategories indicating the severity of the air quality problem.

Clark County, Kentucky, is formally designated as an unclassified area for all of the major criteria pollutants. Because Clark County is in attainment for all criteria pollutants and has no maintenance area designations, CAA conformity requirements do not apply to federal agency actions related to the proposed project.

4.7.2.5 Regulatory Considerations

The 1970 amendments to the CAA established several regulatory programs, including: (1) adoption of emission standards for motor vehicles; (2) adoption of emission standards for major new industrial facilities (New Source Performance Standards [NSPS]); (3) adoption of emission standards for hazardous air pollutants (National Emission Standards for Hazardous Air Pollutants [NESHAPs]); and (4) preconstruction review of major new industrial facilities (New Source Review [NSR] for nonattainment areas, and Prevention of Significant Deterioration [PSD] for attainment areas).

The 1977 amendments to the CAA revised and expanded some of the regulatory programs established by the 1970 amendments. The 1990 amendments to the CAA made further revisions to the established regulatory programs and added a new program (Title V) involving operating permits for major industrial facilities.

In general, states have assumed primary responsibility for enforcing most industrial source emission standards and industrial source review requirements; EPA exercises formal review and oversight responsibilities. Most states have implemented the NSR, PSD, and Title V requirements as formalized air quality permit programs. The Kentucky Division of Air Quality administers air quality permit programs in Kentucky.

4.7.2.6 Existing Air Quality Conditions

The State of Kentucky currently does not have any air quality monitoring stations in Clark County. Data from monitoring stations in the Lexington urban area would not be representative of conditions in the project vicinity. Past air quality monitoring has shown the federal air quality standards are not violated in Clark County or adjacent counties. As noted previously, Clark County is considered to be in attainment for all of the National Ambient Air Quality Standards.

4.8 Water Resources and Water Quality

This section describes existing water resources, site hydrologic conditions, and water use.

4.8.1 Surface Water

The proposed project site is located within the Kentucky River Basin, one of 13 major river basins in the state, approximately 2.8 kilometers (1.75 miles) north of the Kentucky River at River Mile 188 (see Figure 4.8-1). At the project site, the Kentucky River is approximately 75 to 90 meters (250 to 300 feet) wide.

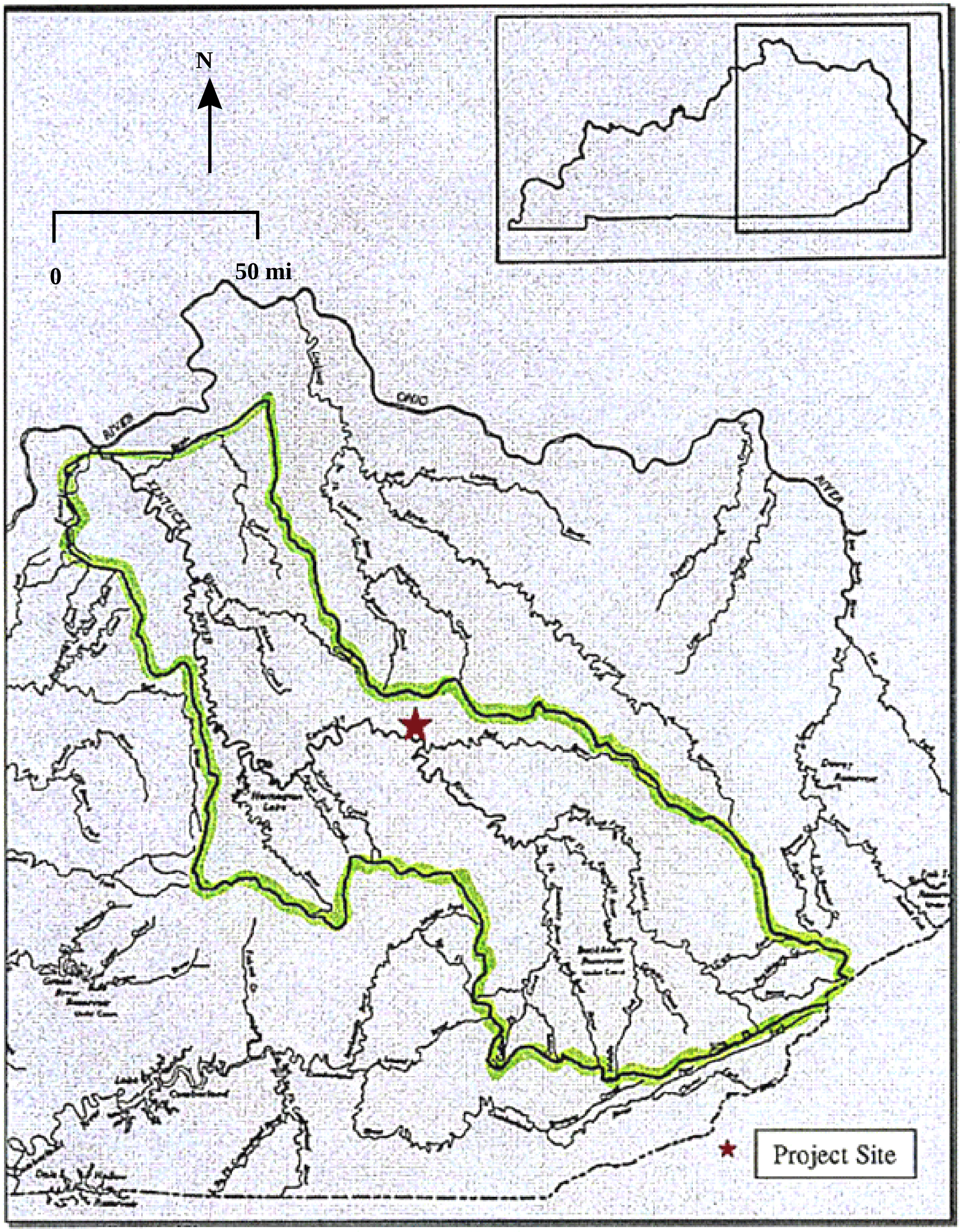
The total drainage area of the Kentucky River Basin is 18,042 square kilometers (6,966 square miles). The Kentucky River extends 407 kilometers (255 miles) from its source where the north and south forks meet near Beattyville, Kentucky, to its confluence with the Ohio River near Carollton, Kentucky. The river is a series of pools created by 14 locks and dams composing the navigation system maintained and operated by the U.S. Army Corps of Engineers (USACE). During periods of low flow, the river is stabilized by the impoundment system. As a result, instead of taking on the characteristics of a small stream, the river remains relatively deep and begins to resemble a lentic (still-water) aquatic system. During high flow periods, the river is characterized by rapid flow rates and undergoes rapid water level fluctuations.

The largest tributary to the Kentucky River near the project site is Upper Howard Creek. It is approximately 26 kilometers (16 miles) long with a drainage area of 6,780 hectares (16,753 acres). Cotton Creek is an intermittent tributary to Upper Howard Creek. The total drainage area of the Cotton Creek Basin is 298 hectares (736 acres). Bull Run is an intermittent tributary to the Kentucky River located near the project site that has a total watershed drainage area of 622 hectares (1,537 acres). Figure 4.8-2 indicates the locations of these waterbodies with respect to the project site.

The mean flow of the Kentucky River at Lock 10, located at River Mile 176.5 (18.5 kilometers [11.5 miles] downstream of the project site) for the years 1961 to 1999 is approximately 158 cubic meters per second (5,600 cubic feet per second) (USGS 2000). The J.K. Smith EA calculated the annual average flow at the site as 150 cubic meters per second (5,285 cubic feet per second), or 12.9 billion liters per day (3.4 billion gallons per day). The 7-day flow with a recurrence interval of 10 years is 4.3 cubic meters per second (152 cubic feet per second) or 371.5 million liters per day (98.2 million gallons per day) (UEC 1980).

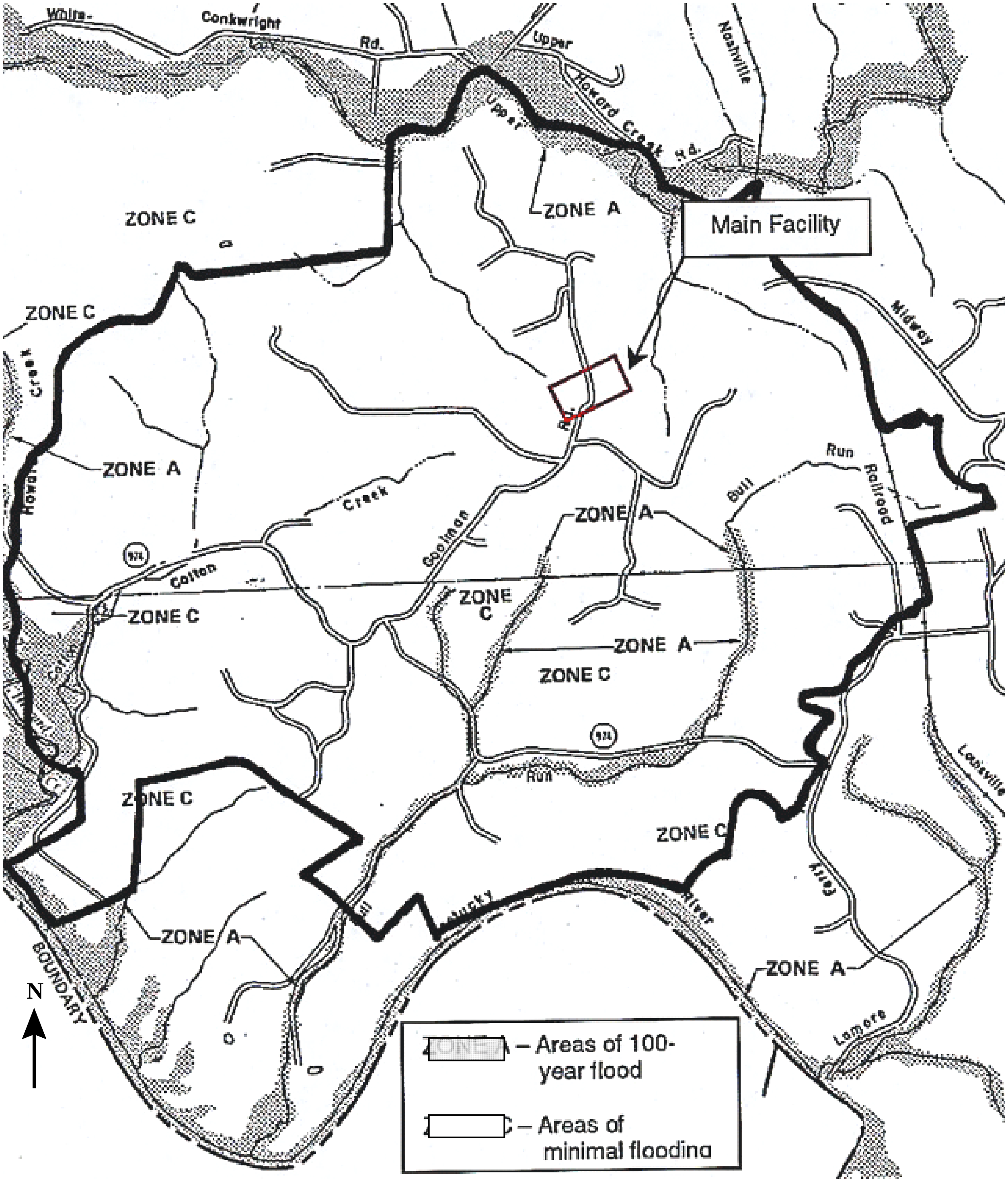
The State of Kentucky designates surface waters as having one or more specific legitimate uses. These uses are: Warm Water Aquatic Habitat; Cold Water Aquatic Habitat; Primary Contact Recreation; Secondary Contact Recreation; Domestic Water Supply; and Outstanding State Resource Water. The Kentucky River in the project vicinity is classified as Warm Water Aquatic Habitat, Primary and Secondary Contact Recreation, and Domestic Water Supply (401 Kentucky Administrative Regulations [KAR] 5:026). In order to maintain the river's specific use designation, the river must meet certain physical, chemical, and biological water quality characteristics. Near the project site, there are several industrial sources that discharge treated wastewater to the Kentucky River. All industrial wastewater sources must comply with the Kentucky Pollutant Discharge Elimination System (KPDES) permits to assist in maintaining the water quality standards and designations. The Kentucky River in the project vicinity fully supports all designated uses (KNREPC 2000).

Pursuant to Section 303(d) of the *Clean Water Act*, the State of Kentucky has developed a list of waterbodies presently not supporting designated uses. As required by 40 CFR 130.7(b)(4), these waters have been prioritized for total maximum daily load development. In the most recently available Section 303(d) list of impaired waters in the state, no such waterbodies were identified in Clark County (KDEP 1998).



Source: EIV 2000.

Figure 4.8-1. The Kentucky River Basin miles



0 1

Source: EIV 2000.

Figure 4.8-2. Location of Surface Waterbodies and Flood Zones

4.8.2 Groundwater

The groundwater in the area of the site is characterized by two zones: a perched groundwater level and the permanent regional groundwater table. The perched groundwater level exists where vertical migration of surface infiltration is halted by relatively impermeable strata. Piezometric levels in such a perched condition vary with time and reflect material zoning and characteristics. The limited water bearing capacity of the more permeable zones of jointed rock precludes long-term, high-volume seepage. Beneath the impermeable strata, at the level of the Kentucky River, lies the permanent regional groundwater table.

As mentioned in Section 4.6, Geology and Soils, during the initial site characterization two borings were completed at the project site. Bedrock was encountered at approximately 1.5 meters (5 feet) beneath the ground surface in both borings. Perched groundwater is indicated on the boring logs at a depth of 1.2 meters (4 feet). These borings were advanced to a depth of up to 18 meters (60 feet) and the regional groundwater table was not encountered.

Six groundwater wells were installed in the jointed bedrock to monitor the regional groundwater table during the initial site characterization. They were installed south and southeast of the project site within a 2.1-kilometer (1.3-mile) radius. The closest is located approximately 1 kilometer (0.6 miles) southeast of the project site. The water level elevation was approximately 216 meters (710 feet) above mean sea level in this well in August 1979. More recent data on the regional groundwater table elevation in this area is not available. However, since the on-site borings did not encounter groundwater at a depth of 18 meters (60 feet), which equates to 226 meters (740 feet) above mean sea level, it can be assumed that the regional groundwater table at the project site lies between 18 to 27 meters (60 to 90 feet) below the ground surface.

Because of the proximity of the project site to the Kentucky River, regional groundwater flow would be expected to be southerly towards the river. Available data support this theory. Although the placement of the six wells is not conducive to obtaining a reliable contour map of the groundwater table elevation, based on the reported groundwater elevations it appears that regional groundwater flow is southerly towards the Kentucky River.

Permeability tests were conducted on the monitoring wells and results ranged from $2x10^{-3}$ to $8x10^{-6}$ centimeters per second. Groundwater velocities were estimated to be on the order of $1x10^{-6}$ centimeters per second (UEC 1980).

Groundwater samples were collected from the six wells and analyzed for chemical parameters. Measured parameters indicated that overall water quality varied widely from well to well. Total dissolved solids exceeded drinking water standards in every well, hydrogen sulfide was detected in each well, and chloride and salinity levels were above those normally considered acceptable for drinking water. Bicarbonate, dissolved oxygen, biochemical oxygen demand, coliform, and nitrate levels varied widely between wells. However, measurements of these parameters at the well closest to the project site were within applicable standards.

Groundwater from depths greater than 15 meters (50 feet) in Clark County is typically highly mineralized, often containing objectionable levels of salt, hydrogen sulfide, and iron (KGS 2001).

In order to identify any existing information on regional groundwater quality in the area, a search of the Kentucky Geological Survey's Groundwater Repository database was conducted. Sixty-nine wells were identified within a 10-kilometer (6-mile) radius of the project site. None of these wells are located within the EKPC property. Water quality data as recent as the late 1990s is available for several of the wells identified. Parameters analyzed in most samples included metals, pesticides, polychlorinated biphenyls (PCBs), and basic water quality parameters such as total dissolved and suspended solids, pH, nitrate, and chloride. Several samples were also analyzed for volatile organic compounds such as trichloroethylene. No pollutants, such as pesticides, PCBs, or volatile organic chemicals, were detected. The overall water quality of most samples was comparable to that discussed above for the wells installed as part of the initial site characterization.

4.8.3 Floodplains

Based on the Federal Emergency Management Agency Flood Insurance Map, the main project site lies completely within Zone C and is therefore not within a 100-year floodplain (see Figure 4.8-2). The project site also lies above the 500-year floodplain.

The existing water intake and discharge structures are located within the Kentucky River, and as such are not considered to be in the 100-year floodplain. The proposed modifications to these structures and all construction required for the project would not take place within a floodplain.

4.8.4 Wetlands

The Natural Resources Conservation Service branch of the U.S. Department of Agriculture has the responsibility of making wetland determinations on agricultural and non-agricultural lands that contact land currently used for agricultural purposes. The USACE has the responsibility for certifying all other non-agricultural land, including wetlands. Based on the data provided by the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory Program, there are no wetlands located on the proposed main facility site. However, within the rail loop, a few wetland areas were indicated by a USFWS aerial survey completed in the early to mid-1980s. Within this same time period EKPC was conducting extensive cut and fill operations at the site. A recent survey by an EKPC wetlands biologist found that there were no wetlands within the project area (KPE 2001). In addition, the site is not within a 100-year floodplain (an area subject to a 1 percent chance of flooding in any given year). The site would best be described as an "old field" (EKPC 2000a).

4.8.5 Water Use

Except for agricultural users, large users (greater than 10,000-gallons per day) of water in Kentucky are required to obtain a water withdrawal permit from the Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection's Division of Water. As a permit holder, these facilities are required to report actual water withdrawals. Under Kentucky law, however, steam electric power generating facilities regulated by the Public Service Commission are exempt from this permitting process. As a result, an accurate inventory of the volume of water being removed each day by the existing power plants is not available.

According to the Kentucky Division of Water, approximately 3,459.93 million liters (914.02 million gallons) per day of water was withdrawn in Kentucky by permitted sources including water suppliers, mining, industrial and commercial (self-supplied facilities), and aquaculture users in 2001. This total does not include estimated amounts of water used for power production. Hydroelectric power is estimated to use 314 billion liters per day (83 billion gallons per day), but virtually all of it is returned to the sources from which it is obtained. Thermoelectric power production withdraws an estimated 12.87 billion liters per day (3.4 billion gallons per day), of which 768.4 million liters (203 million gallons) are consumed (KDEP 2002).

The cumulative effects of withdrawals from the Kentucky River by power plants have been discussed by the Kentucky Natural Resources and Environmental Protection Cabinet in their cumulative assessment report. When issuing permits for water withdrawal, in order to ensure that sufficient flow is reserved for allocation to future users and to maintain water quality and stream habitat, the Division of Water allocates no more than 10 percent of a stream's lowest average monthly flow to any one user. During low flow conditions, potential conflicts could exist between competing water users. In order to minimize these conflicts, the Division of Water is able to limit withdrawals from permitted sources if necessary (KNREPC 2001).

4.9 Ecological Resources

The following ecological resources description and discussion is intended to provide the reader with a general overview of the biota present within the region and at the proposed site location. The J.K. Smith EIS addressed construction of a power plant within the 1,263-hectare (3,120-acre) J.K. Smith Site with the project complex to be a 121-hectare (300-acre) parcel of land located in the northeast portion of the site. The J.K. Smith Units 1 and 2 were never constructed; however, the 121-hectare (300-acre) site was cleared, and construction of rail facilities, foundations, and infrastructure were completed before the project was halted (EIV 2000). The currently proposed Kentucky Pioneer IGCC Demonstration Project consists of a 4.8-hectare (12-acre) process area proposed for construction and operation within this same previously disturbed 121-hectare (300-acre) portion (EIV 2000). The proposed site has not changed appreciably in the 20-year period since the Final J.K. Smith EIS was prepared (EKPC 2000a, EIV 2000). As previously acknowledged, much of the site was graded before construction was halted. The entire project site has been previously disturbed either from historic agricultural practices or the previous power station site preparation (EKPC 2000a). More specifically, the Kentucky Pioneer IGCC Demonstration Project would be developed on that portion of the site previously cleared (EIV 2000). Figures 3.1-3 to 3.1-6 illustrate the current site conditions.

The route of the proposed new 27-kilometer (17-mile) transmission line has not been determined. It will be constructed within the flora (vegetation) and fauna (animals) communities described in the following sections. Ecological resource descriptions will be provided in separate NEPA documentation that will be prepared in accordance with the Rural Utility Service's regulations.

4.9.1 Flora

Kentucky is located entirely within the deciduous forest formation of eastern North America and in an area described for eastern Kentucky as Mixed Mesophytic Forest and throughout most of central and western Kentucky as Western Mesophytic Forest. The diverse vegetation of Kentucky is largely a function of the diverse geology and soils. An estimated 40 percent of Kentucky remains forested and in a natural or semi-natural condition (GAP 1998).

The proposed project site lies within the eastern deciduous forest formation, in the ecological transitional area between the Knobs border area of the Mixed Mesophytic Forest region and the Bluegrass section of the Western Mesophytic Forest region. Little original vegetation remains in the Bluegrass section and in the Knobs/Bluegrass transitional area. A range of environmental variables, such as those provided by micro sites ranging from xeric (dry) exposed hilltops to mesic (moist) sheltered coves, determines the abundance and distribution of the dominant plant species. Major vegetation communities near the site consist of mature wooded communities on uplands and slopes, successional stages of these communities, pasture, cropland, and abandoned cropland. Most of the land within an 8-kilometer (5-mile) radius has been logged or grazed during some period since European settlement. Wooded riparian communities and lowland communities cover relatively small areas (REA 1980).

The proposed site location was previously used for agricultural purposes and further disturbed by limited construction of the cancelled power project described above. It is a fescue (grass) dominated xeric (dry) ridgetop typical of the Bluegrass Region. Nearby slopes are characterized by the presence of red cedar interspersed with patches of prairie remnant. There are no jurisdictional wetlands present on the proposed main facility site.

Riparian vegetation is present along the Kentucky River and adjacent to the existing water intake and discharge points (KPE 2001). The current effluent line discharges to the Kentucky River are in accordance with Kentucky Department of Environmental Protection regulations (KPE 2001). Canopy vegetation is typified by sycamore (*Plantanus occidentalis*), boxelder (*Acer negundo*), and silver maple (*Acer saccharinum*).

4.9.2 Fauna

White-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) are the larger mammals present. The red fox (*Vulpes fulva*), gray fox (*Urocyon cinereoargenteus*), Virginia opossum (*Didelphis marsupialis*), woodchuck (*Marmota monax*), fox squirrel (*Sciurus niger*), red squirrel (*Tamiasciurus hudsonicus*), grey squirrel (*Sciurus carolinensis*) eastern cottontail (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), muskrat (*Ondatra zibethica*), white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*) are representative of the small mammals found in the state.

Among the great variety of resident birds found in Kentucky are the cardinal (*Cardinalis cardinalis*), which is the State bird, and the blue jay (*Cyanocitta cristata*), Carolina chickadee (*Parus carolinensis*), tufted titmouse (*Parus bicolor*), crow (*Coruus brachyrhynchos*), white-breasted nuthatch (*Sitta carolinensis*), several species of hawks, owls, woodpeckers, and sparrows. Common migratory birds include the catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), great crested flycatcher (*Myiarchus crinitus)*, slate-colored junco (*Junco hyemalis*), golden-crowned kinglet (*Regulus satrapa*), yellow-bellied sapsucker (*Sphyrapicus varius)*, cedar waxwing (*Bombycilla cedrorum*), and many species of warbler. Popular game birds include the bobwhite (*Colinus virginianus*), quail woodcock (*Philohela minor*), ring-necked pheasant (*Phasianus colchicus*), rock dove (*Columba livia*), wild turkey (*Meleagris gallopavo*), and waterfowl (Microsoft Encarta 2000). A study in adjacent Madison County recorded 159 bird species of which 88 breed in the area (REA 1980).

There is a fairly rich diversity of amphibians and reptiles in Kentucky consisting of approximately 99 species. Common amphibians include the newt (*Notophthalmus viridescens*), dusky salamander (*Desmognathus fuscus*), bullfrog (*Rana catesbeiana*), American toad (*Bufo americanus*), and spring peeper (*Pseudacris crucifer*); common reptiles include the snapping turtle (*Chelydra serpentina*), box turtle (*Terrapene carolina*), painted turtle (*Chrysemys picta*), and five-lined skink (*Eumeces fasciatus*). The most widespread snakes include the eastern garter snake (*Thamnophis sirtalis*), northern water snake (*Nerodia sipedon*), and black rat snake (*Elaphe obsoleta*). Poisonous snakes include the timber rattlesnake (*Crotalus horridus*), cottonmouth (*Agkistrodon piscivorus*), and copperhead (*Agkistrodon contortrix*) (REA 1980).

Kentucky's fish fauna is more diverse than that of all other states except Tennessee and Alabama. The Kentucky River has 115 native species. The pools of the river support excellent warm water fisheries featuring crappie (*Pomoxis*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), small mouth black bass (*Micropterus dolomieu*), and catfish. In addition, muskellunge (*Esox Masquinongy*) and rainbow trout (*Oncorhynchus mykiss*) have been introduced. Similarly, Kentucky contains a rich diversity of mussel species with only Tennessee and Alabama having more. This group of organisms is the most endangered in Kentucky and the Nation. Approximately 56 percent of the Kentucky mussel species are found in the Kentucky River Basin (KNREPC 2000). Fauna present at the project site are typical of those found in similar habitats within the Knobs/Bluegrass transitional area.

4.9.3 Threatened, Endangered, and Sensitive Species

Correspondence received from the USFWS indicated that no federally-listed or proposed endangered or threatened species occur within the impact area of the project area (USFWS 2000a). The running buffalo clover (*Trifolium stoloniferum*) is a species which is listed as endangered under the *Endangered Species Act*. The USFWS has recommended that this species be evaluated for potential impacts resulting from the proposed project (USFWS 2000b). Table 4.9-1 is a compilation of special interest species listed by the Kentucky State Nature Preserves Commission as potentially occurring in Clark County.

Table 4.9-1. Potentially Occurring Special Interest Species in Clark County

Taxonomic Group	Scientific Name	Common Name	Statuses KY/Federal	Ranks
Plant	*Lesquerella globosa*	Lesquereux's Bladderpod	T/C	G2/S2
Plant	*Liparis loeselii*	Loesel's Twayblade	T	G5/S2/S3
Plant	*Malvastrum hispidum*	Hispid Falsemallow	T	G5/S2
Plant	*Rubus whartoniae*	Wharton's Dewberry	T	G2/S2
Plant	*Salix amygdaloides*	Peach-leaved Willow	H	G5/SH
Plant	*Schizachne purpurascens*	Purple Oat	T	G5/S2
Plant	*Spiranthes lucida*	Shining Ladies'-tresses	T	G5/S2/S3
Plant	*Stellaria fontinalis*	Water Stitchwort	T	G3/S1/S2
Plant	*Trichostema setaceum*	Narrowleaf Bluecurls	E	G5/S1/S2
Plant	*Trifolium stoloniferum*	Running Buffalo Clover	T/LE	G3/S2/S3
Plant	*Viola walteri*	Walter's Violet	T	G4/G5/S1/S2
Bivalve	*Villosa lienosa*	Little Spectaclecase	S	G5/S3/S4
Crustacean	*Cambarus veteranus*	A Crayfish	S	G3/S1
Insect	*Speyeria idalia*	Regal Fritillary	H	G3/SH
Bird	*Ammodramus henslowii*	Henslow's Sparrow	S	G4/S3
Bird	*Chondestes grammacus*	Lark Sparrow	T	G5/S2/S3
Bird	*Dolichonyx oryzivorus*	Bobolink	S	G5/S2/S3
Bird	*Nycticorax nycticorax*	Black-crowned Night-heron	T	G5/S1/S2
Mammal	*Mustela nivalis*	Least Weasel	S	G5/S2/S3

Kentucky State Nature Preserves Commission status:
E = Endangered, T = Threatened, S = special concern, H = historic
U.S. Fish and Wildlife Service status:
C = candidate for federal listing, LE = listed as endangered
Ranks:
G-RANK: Estimate of species abundance on a global scale:
G1 = extremely rare, G2 = rare, G3 = uncommon, G4 = common, G5 = very common,
S-RANK: Estimate of species abundance in Kentucky:
S1 = extremely rare, S2 = rare, S3 = uncommon, S4 = many occurrences, S5 = very common, SH = historically known in state
Source: KSNPC 2000.

4.10 Noise

This section discusses the noise levels at the proposed Kentucky Pioneer IGCC Demonstration Project site.

4.10.1 Noise Terminology

Sound is caused by vibrations that generate waves of air pressure fluctuations in the air. Air pressure fluctuations that occur from 20 to 20,000 times per second can be detected as audible sound. The number of pressure fluctuations per second is normally reported as cycles per second or Hertz. Different vibrational frequencies produce different tonal qualities for the resulting sound. In general, sound waves travel away from the noise source as an expanding spherical surface. The energy contained in a sound wave is consequently spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the noise source.

Sound level meters typically report measurements as a composite decibel (dB) value. Decibel scales are a logarithmic index based on ratios between a measured value and a reference value. In the field of atmospheric acoustics, dB scales are based on ratios of the actual pressure fluctuations generated by sound waves compared to a standard reference pressure value of 20 micropascals (4.18×10^{-7} pounds per square foot).

Modern sound level meters measure the actual air pressure fluctuations at a number of different frequency ranges, most often using octave or 1/3 octave intervals. The pressure measurements at each frequency interval are converted to a decibel index and adjusted for a selected frequency weighting system. The adjusted decibel values for the different octave or 1/3 octave bands are then combined into a composite sound pressure level for the appropriate decibel scale.

Human hearing varies in sensitivity for different sound frequencies. The ear is most sensitive to sound frequencies between 800 and 8,000 Hertz, and is least sensitive to sound frequencies below 400 Hertz or above 12,500 Hertz. Several different frequency weighting schemes have been developed, using different dB adjustment values for each octave or 1/3 octave interval. Some of these weighting schemes are intended to approximate the way the human ear responds to noise levels; others are designed to account for the response of building materials to airborne vibrations and sound. The most commonly used decibel weighting schemes are the A-weighted and C-weighted scales.

The “A-weighted” decibel scale (dBA) is normally used to approximate human hearing response to sound. The dBA scale significantly reduces the measured pressure level for low frequency sounds while slightly increasing the measured pressure level for some middle frequency sounds. The “C-weighted” decibel scale (dBC) is often used to characterize low frequency sounds capable of inducing vibrations in buildings or other structures. The dBC scale makes only minor reductions to the measured pressure level for low frequency components of a sound while making slightly greater reductions to high frequency components than does the dBA scale.

4.10.2 Common Noise Descriptors

Varying noise levels are often described in terms of the equivalent constant decibel level. Equivalent noise levels (L_{eq}) are used to develop single-value descriptions of average noise exposure over various periods of time. Such average noise exposure ratings often include additional weighting factors for annoyance potential due to time of day or other considerations. The L_{eq} data used for these average noise exposure descriptors are generally based on dBA sound level measurements, although other weighting systems are used for special conditions (such as blasting noise).

Average noise exposure over a 24-hour period is often presented as a day-night average sound level (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises. Unless specifically noted otherwise, L_{dn} values are assumed to be based on dBA measurements.

4.10.3 Working With Decibel Values

The nature of dB scales is such that individual dB ratings for different noise sources cannot be added directly to give the dB rating of the combination of these sources. Two noise sources producing equal dB ratings at a given location will produce a composite noise level 3 dB greater than either sound alone. When two noise sources differ by 10 dB, the composite noise level will be only 0.4 dB greater than the louder source alone. Most people have difficulty distinguishing the louder of two noise sources that differ by less than 1.5 to 2 dB. In general, a 10 dB increase in noise level is perceived as a doubling in loudness. A 2 dB increase represents a 15 percent increase in loudness, a 3 dB increase is a 23 percent increase in loudness, and a 5 dB increase is a 41 percent increase in loudness.

When distance is the only factor considered, sound levels from an isolated noise source will typically decrease by about 6 dB for every doubling of distance away from the noise source. When the noise source is essentially a continuous line (e.g., vehicle traffic on a highway), noise levels decrease by about 3 dB for every doubling of distance.

4.10.4 Guidelines for Interpreting Noise Levels

The federal *Noise Control Act* of 1972 (Public Law 92-574) established a requirement that all federal agencies must administer their programs in a manner that promotes an environment free from noise that jeopardized public health or welfare. The EPA was given the responsibility for providing information to the public regarding identifiable effects of noise on public health or welfare, publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety, coordinating federal research and activities related to noise control, and establishing federal noise emission standards for selected products distributed in interstate commerce. The federal *Noise Control Act* also directed that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations.

Although EPA was given major public information and federal agency coordination roles, each federal agency retains authority to adopt noise regulations pertaining to agency programs. EPA can require other federal agencies to justify their noise regulations in terms of the federal *Noise Control Act* policy requirements. The Occupational Safety and Health Administration (OSHA) retains primary authority for setting workplace noise exposure standards. Due to aviation safety considerations, the Federal Aviation Administration retains primary jurisdiction over aircraft noise standards.

To coordinate with the requirements of the federal *Noise Control Act*, EPA has identified indoor and outdoor noise limits to protect public health and welfare (hearing damage, sleep disturbance, and communication disruption) (EPA 1971). Outdoor L_{dn} values of 55 dB and indoor L_{dn} values of 45 dB are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and health care areas. Noise level criteria to protect against hearing damage in commercial and industrial areas are identified as 24-hour L_{eq} values of 70 dB (both outdoors and indoors).

The U.S. Department of Housing and Urban Development has established guidelines for evaluating noise impacts on residential projects seeking financial support under various grant programs (44 *Federal Register* [FR] 135). Sites are generally considered acceptable for residential use if they are exposed to outdoor L_{dn} values of 65 dB or less. Sites are considered “normally unacceptable” if they are exposed to outdoor L_{dn} values of 65-75 dB. Sites are considered unacceptable if they are exposed to outdoor L_{dn} values above 75 dB.

4.10.5 Existing Noise Conditions

Studies conducted in 1979 for the J.K. Smith Power Station included ambient noise monitoring at several locations on or near the EKPC property. Locations that were not influenced by highway traffic had L_{dn} levels of 39 to 55 dBA (UEC 1980). Locations along Kentucky Highway 89 had L_{dn} levels of 52 to 69 dBA (UEC 1980). Average daytime noise levels were generally similar to or slightly higher than the L_{dn} values. Average nighttime noise levels were typically much lower than daytime values, often being close to 30 dBA. The noise levels reported for the project vicinity during 1979 are typical of quiet rural areas. EKPC has constructed four 80-MW combustion turbine units near the Kentucky Pioneer IGCC Demonstration Project Site, and is proposing a fifth unit. Noise monitoring conducted by EKPC since 1992 confirms that the noise data collected in 1979 are still representative of ambient noise conditions. The measured noise level at the perimeter of the EKPC combustion turbine site was 39 dBA on July 30, 1999, with three turbine units in operation.

4.11 Traffic and Transportation

This section discusses the major road and rail transportation routes to the proposed project site. Existing traffic levels are discussed for each method of transportation.

4.11.1 Roadways

The primary access routes to the ROI are Interstates 64 and 75. Interstate 64 is the main east-west artery and passes through Clark and Fayette Counties and the town of Winchester. Interstate 75 is the main north-south artery and passes through Fayette and Madison Counties. Kentucky Highway 627, a two-lane road, is the major north-south access road through Clark County and intersects with Interstate 64 in Winchester. Winchester is the location of the major interchanges for access to the project site. The community of Trapp is typically reached by traveling south from Winchester on Kentucky Highway 89, a two-lane road, for approximately 20.8 kilometers (13 miles). Kentucky Highway 974, another two-lane road, is an alternate route to Trapp from Winchester; however, the road switches from high type paved road to intermediate type paved road approximately 10.4 kilometers (6.5 miles) from Winchester. Trapp can also be accessed by heading east on the two-lane Kentucky Highway 52 from Richmond, in Madison County, and then traveling north on Kentucky Highway 89. The lack of bridges across the Kentucky River near the project location restricts access to the site from other highways. Kentucky Highways 1028 and 3369 are the other main roads in the vicinity of Trapp. The project site is serviced by an approximately 1.6-kilometer (1-mile) long access road that extends west from Kentucky Highway 89. No traffic control devices are in place at the intersection of the access road and Kentucky Highway 89.

Current and recent daily traffic loads for roads from Winchester and Madison to Trapp are presented in Table 4.11-1 at the end of this section. All data was obtained from the Kentucky Transportation Cabinet's Traffic Counts searchable database computer program, which provides historic traffic count data for Interstates and Kentucky and County Highways throughout the state (CTS 2001). The Actual Count data presented in the table is the average number of car trips per 24 hours for that particular road segment. The mileposts (MP) presented in the table are those established by the Kentucky Transportation Cabinet for the purposes of collecting traffic counts. The site access road intersects Kentucky Highway 89 between MP 2.9 and MP 4.8. Data is only presented to MP 9.7 for Kentucky Highway 974 because the highway turns to the north at that point while Red River Road continues southeast toward the community of Trapp. No traffic studies are available for Red River Road. Data for Kentucky Highway 52 is presented from the intersection with Interstate 75 to the intersection with Kentucky Highway 89 in Estill County. Capacity data for Kentucky Highways is unavailable as no capacity studies have been completed.

4.11.2 Railroads

The project site is located approximately 0.8 kilometer (0.5 mile) west of a 198-kilometer (123-mile) freight rail line segment that runs between Winchester and Typo, Kentucky. The line segment, identified as number C-273, is owned and operated by CSX Transportation, Inc., of Jacksonville, Florida, and has been operating in the region for an extended period of time. Existing rail traffic data for the line as reported in the *Proposed Conrail Acquisition Final Environmental Impact Statement* averages 13.1 freight trains per day (STB 1998). An approximately 5-kilometer (3.1-mile) long rail loop extends from the main freight line into the J.K. Smith Site. The project site also contains extensive rail yard capacity that is linked to the rail loop at several locations.

Table 4.11-1. Traffic Levels for Main Roads Approaching and Located in Trapp, Kentucky

Highway Number	Functional Class	City	County	Beginning MP	Ending MP	Actual Count	Year	Estimated Count, 2001
Winchester to Trapp								
89	Rural- Major Collector	Trapp	Clark	2.9[c]	4.8	1,554	2000	1,520
89	Rural- Major Collector	N/A	Clark	4.8	9.2	2,252	2000	2,270
89	Rural- Major Collector	N/A	Clark	9.2	12.6	2,642	2000	2,690
89	Rural- Major Collector	N/A	Clark	12.6	13.7	3,730	2000	3,680
89	Rural- Major Collector	Winchester	Clark	13.7	14.9	3,880	1995	4,110
89	Urban- Minor Arterial	Winchester	Clark	14.9	15.4	6,743	1995	6,240
89	Urban- Minor Arterial	Winchester	Clark	15.4	16.0	10,192	1995	10,600
974	Urban- Minor Arterial	Winchester	Clark	0.0	0.2	4,163	1999	4,210
974	Urban- Minor Arterial	Winchester	Clark	0.2	0.4	2,226	1995	2,370
974	Urban- Minor Arterial	Winchester	Clark	0.4	1.0	2,516	1999	2,540
974	Rural- Minor Collector	Winchester	Clark	1.0	3.1	1,745	1995	1,900
974	Rural- Minor Collector	N/A	Clark	3.1	4.0	1,080	1999	1,110
974	Rural- Minor Collector	N/A	Clark	4.0	6.5	630	1995	669
974	Rural- Minor Collector	N/A	Clark	6.5	9.7	200	1999	211
Richmond to Trapp								
52	Urban- Other Principal Arterial	N/A	Madison	8.3	10.5	8,023	1997	8,400
52	Urban- Other Principal Arterial	Richmond	Madison	10.5	10.8	13,189	1997	13,100
52	Urban- Other Principal Arterial	Richmond	Madison	10.8	10.9	15,907	2000	16,000
52	Urban- Minor Arterial	Richmond	Madison	10.9	11.2	18,390	1998	19,800
52	Urban- Minor Arterial	Richmond	Madison	11.2	11.4	29,090	1997	31,600
52	Urban- Minor Arterial	Richmond	Madison	11.4	11.9	21,281	1997	22,100
52	Urban- Minor Arterial	Richmond	Madison	11.9	12.2	5,493	1997	5,140
52	Urban- Minor Arterial	Richmond	Madison	12.2	13.0	6,636	2000	6,800
52	Urban- Minor Arterial	Richmond	Madison	13.0	13.9	18,023	2000	18,400
52	Rural- Major Collector	N/A	Madison	13.9	15.4	16,738	2000	17,100
52	Rural- Major Collector	N/A	Madison	15.4	17.8	13,209	2000	13,600
52	Rural- Major Collector	N/A	Madison	17.8	19.8	10,143	1998	10,800
52	Rural- Major Collector	N/A	Madison	19.8	22.9[a]	8,022	1998	8,550
52	Rural- Major Collector	N/A	Estill	0.0[a]	2.1	7,332	1998	7,930
52	Rural- Major Collector	N/A	Estill	2.1	3.7	9,427	1999	10,200
52	Rural- Major Collector	N/A	Estill	3.7	5.4	7,357	1999	8,240
52	Rural- Major Collector	N/A	Estill	5.4	5.9	11,434	1999	11,900
52	Rural- Major Collector	Irvine	Estill	5.9	6.7	10,711	1998	12,500
52	Rural- Major Collector	Irvine	Estill	6.7	7.6	18,284	1999	19,000
89	Rural- Major Collector	Irvine	Estill	11.3	11.4	19,734	1996	22,300
89	Rural- Major Collector	Irvine	Estill	11.4	11.5	13,905	1999	14,200
89	Rural- Major Collector	Irvine	Estill	11.5	11.6	13,132	1999	13,200
89	Rural- Major Collector	Irvine	Estill	11.6	11.8	16,277	1999	16,800
89	Rural- Major Collector	Irvine	Estill	11.8	11.9	7,059	1998	8,410
89	Rural- Major Collector	Irvine	Estill	11.9	13.0	13,209	1996	13,800
89	Rural- Major Collector	N/A	Estill	13.0	14.2	6,419	1997	6,470
89	Rural- Major Collector	N/A	Estill	14.2	17.9	4,498	1998	4,830
89	Rural- Major Collector	N/A	Estill	17.9	18.6	1,749	1999	1,870
89	Rural- Major Collector	N/A	Estill	18.6	22.5[b]	1,269	2000	1,250
89	Rural- Major Collector	N/A	Clark	0.0[b]	2.9[c]	1,269	2000	1,250
Trapp								
1028	Rural- Local	N/A	Clark	0.0	1.7	182	1999	191
1028	Rural- Local	N/A	Clark	1.7	4.0	118	2000	112
3369	Rural- Minor Collector	N/A	Clark	0.0	1.3	440	1999	450
3369	Rural- Minor Collector	N/A	Clark	1.3	2.6	593	1995	611

Note: The MPs on Highways 89 and 974 in Clark County run in opposite directions. Highway 89 terminates in Winchester while Highway 974 originates in Winchester.
[a]MP 0.0 on Highway 52 in Estill County is the same as MP 22.9 in Madison County (Estill/Madison Border).
[b]MP 0.0 on Highway 89 in Clark County is the same as MP 22.5 in Estill County (Clark/Estill Border).
[c]MP2A on Highway 89 is the closest measurement interval to the project site entrance.
Source: CTS 2001.

4.12 Occupational and Public Health and Safety

This section discusses the regulations of worker and public health and safety, and the existing hazards at the proposed project site.

4.12.1 Regulatory Considerations

Occupational health and safety issues are primarily the responsibility of OSHA. OSHA regulations applicable to the construction and operation activities at the proposed site include 29 CFR 1910 and 29 CFR 1926. The State of Kentucky has supplemental worker safety requirements. The EPA and the State of Kentucky have primary regulatory jurisdiction over hazardous waste management issues. Separate hazardous waste management programs and requirements exist for solid and liquid wastes, wastewater discharges, and air releases of hazardous materials.

4.12.2 Existing Hazard Conditions

Although the proposed project site was previously disturbed by preliminary grading and some foundation construction work, there are no developed facilities at the site. Thus, there are no existing worker or public safety hazards associated with industrial chemicals at the site. Conditions related to air quality, water quality, noise, geologic conditions, and transportation systems are discussed in previous sections.

The most recent available data on health status for Clark and Madison Counties show that the leading causes of death in the population are diseases of heart (31.4 percent) and malignant neoplasms (23.6 percent). For malignant neoplasm-related fatalities, lung cancer was the leading cause of death (KDPH 2000). In 1998, there were 118 fatal occupational injuries in the state, 30 agricultural and 88 non-agricultural. Fatal injuries decreased by 13 percent for agricultural and 27 percent for non-agricultural in 1998 compared to 1997. There were an estimated 49,091 nonfatal occupational injuries reported in 1998, 649 agricultural and 48,442 non-agricultural. Nonfatal agricultural and non-agricultural injuries reported in 1998 increased by 8.4 and 9 percent, respectively, compared to 1997.

4.13 Waste Management

There are no ongoing waste management activities at the proposed project site. There are no contained solid waste landfills in Clark County. The closest contained solid waste landfills to the proposed project site are in Estill (Blue Ridge Recycling & Disposal) and Montgomery (Montgomery County Landfill) Counties. Blue Ridge Recycling & Disposal accepts solid waste and some special wastes. This landfill has an expected life of approximately 22 years. The Montgomery County Landfill accepts construction debris, municipal solid waste, and all types of special waste. Its expected life is approximately 15.5 years; however, a horizontal expansion study is currently being conducted which may result in a doubling of landfill space and an increase in expected life. In addition, there are numerous solid waste facilities located in the State of Kentucky. There are no hazardous waste landfills in Kentucky.